SECTION 15335

FIRE PROTECTION
DRY PIPE SPRINKLER SYSTEM

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Edit this section to suit project requirements.

When project consists only of Fire Protection, include the following specifications in bid package.

01015	**LANL/Contractor Furnished Property and Services**
01090	**Reference Standards**
01300	**Submittals**
01630	**Product Options and Substitutions**
01700	**Contract Closeout**
01720	**Project Record Documents**
13085	**Seismic Protection**
15190	**Mechanical Identification**
15470[02675]	**Disinfection of Water Piping**
15922	**Testing Piping Systems**
16721	**Fire Alarm and Detection System**

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PART 1 GENERAL

1.1 SECTION INCLUDES

A. Scope of Work: Furnish design, shop drawings, project record drawings (as-built), equipment, fabrication, labor, transportation and supervision necessary to install, flush, test and place into service a complete hydraulically designed automatic dry pipe sprinkler system.

B. Components: System shall consist of, but not be limited to, interconnecting piping, fittings, control valves, check valves, alarm valve with trim, detection system fire department connection, sprinkler heads, hangers, bracing, Inspector's test stations, drains, sprinkler alarm and other devices for a complete installation in accordance with codes, standards and recommended practice referenced in this Section.

1.2 SUBMITTALS

A. Submit the following in accordance with Section 01300:

B. Hydraulic Calculations prepared in accordance with NFPA 13. Submit calculations with shop drawings.

1. Calculate demand point for each system so that it remains a minimum of 5 psi below final water supply curve at base of riser. Final water supply curve shall be after required 500 gpm hose streams and friction loss to base of riser have been deducted.

2. Include in calculations elevation differences between point of water test and base of riser. Include graphical representation of final water supply curve.

3. The following preliminary flow data is provided to the Contractor for bidding purposes: static _____ psig, residual _____ psig, flow _____ gpm, hydrant number ____.

4. Base system design on actual flow information provided by LANL. Request actual flow data in a timely manner to maintain project schedules.

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Static seismic calculations are required if performance category is PC=1 or PC=2. Dynamic seismic calculations are required if performance category is PC=3 or PC=4. Reference paragraph 2.1 for performance category.
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C. Seismic Calculations:

1. Provide static seismic calculations, certified by a registered professional engineer.

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OR
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1. Provide calculations based on a dynamic analysis certified by a registered professional engineer with expertise in dynamic seismic analysis. Calculate in-structure response for system such that performance of system within structure meets the required performance category criteria in DOE STD1020.

2. Provide qualifications of dynamic analyst and documentation of computer software systems for review and approval by LANL.

D. Catalog Data

E. Certifications for welders in accordance with NFPA 13.

F. Installation Instructions

G. Materials Part List

H. Shop Drawings using a minimum scale of 1/8" = 1'0" for plans and 1/4" = 1'0" for details. All lettering shall be a minimum of 1/8 inch high.

1. Show information required by NFPA 13, including piping, sprinklers, hangers, flexible couplings, roof construction, electro-mechanical devices, occupancy of each area, and ceiling and roof heights.

2. Base working plans on actual survey of existing conditions.

3. Show hydraulic reference points and remote areas.

I. Test Reports

J. Operation and Maintenance Manual: Submit system description, system theory of operation, system final inspection and Contractor's material and test certificates per NFPA 13, of the completed system project record documents.

1. Include in operation and maintenance manuals, instructions, a brief description of type of system installed, routine type work defined by step-by-step instructions, and recommended frequency of performance.

2. Also include in instructions, possible malfunctions with diagnostic methods and suggested correction of each.

3. Describe function of each component or subassembly in the theory of operation brochures.

K. Project Record Drawings (As-Built) on mylar reproducibles reflecting as-built conditions showing Work completed under this Section.

1. Base as-built drawings on actual survey of the completed installation.

2. Include notes on all special systems or devices such as dry pendant heads, antifreeze loops and inspector's test stations.

3. Provide revised hydraulic calculations demonstrating water supply restrictions have not been exceeded when conditions of installation are different from those anticipated during preparation of Project Record Documents.

1.3 QUALITY ASSURANCE

A. Provide proof that installation firm has satisfactorily performed at least ten projects of equivalent nature and scope of the Projects herein; and is licensed within the USA to engage in design, fabrication and installation of automatic sprinkler systems for fire protection.

1.4 DELIVERY, STORAGE, AND HANDLING

A. Materials and Equipment: Protect materials and equipment from damage during shipping, storage and installation.

B. Plugs and Cover Plates: Protect threaded ends, flanged openings with gasketed metal cover plates to prevent damage during shipment and to prevent foreign materials from entering. Cap or plug drains, vents, small piping, and gauge connections.

PART 2 PRODUCTS

2.1 DESIGN AND MATERIALS

A. Design system in accordance with NFPA 13.

1. Minimum classification Ordinary Hazard Group II.

2. Conform to extra or special hazard requirements where required or indicated.

3. Conform to NFPA 13 for storage occupancies with potential storage height greater than 12 feet and other special hazard occupancies.

4. System to operate at 7500 feet altitude.

5. Provide necessary devices to separate system into individual and distinct alarm zones. Provide a minimum of one zone per floor.

B. Seismic Design: Protect automatic sprinkler system above grade to prevent pipe breakage in accordance with NFPA 13 and Appendix A.

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Consult with ESH-3 to determine hazard classification of facility. For no hazard, use PC=1 for seismic performance category; for low hazard, use PC-2; for moderate hazard, use PC=3; for high hazard, use PC=4. Document phone conversation. Verify performance category with study or CDR.
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1. Seismic Performance Category: [ ]

2. Reference Section 13085, Seismic Protection.

3. Reference DOE STD1020 to determine extent of seismic protection.

C. Provide new fire protection materials and equipment, UL listed or FM approved, conforming to requirements of NFPA 13.

2.2 PIPING MATERIAL

A. Provide sprinkler piping above grade in accordance with this Section and NFPA 13.

2.3 FITTINGS

A. Use galvanized fittings in piping system installed outside above grade.

B. Do not use rolled fittings.

2.4 VALVES AND STRAINERS

A. Provide listed or approved valves and strainers rated at 175 psi or greater working pressure.

B. Provide flanged ends for sizes greater than 2 inches and NPT screwed ends for sizes 2 inches and smaller. Grooved ends (mechanical joints) are acceptable.

C. Check Valves: In sizes 3 inch and larger, provide 3/4 inch NPT drainage taps.

D. Ball Drip Valves: Provide automatic ball drip valves, 1/2 or 3/4 inch, normally open, which close when flow of water through valve exceeds 4 through 10 gpm.

E. Strainers: Provide "Y" type strainers with cast iron body and 30 mesh stainless steel screen.

F. Alarm Valve: Minimum acceptable size is 4 inches. Provide two 250 psi water pressure gauges and necessary valves and trim for alarm valve operation.

1. Provide bypass valve in trim to allow test operation of pressure alarm switch without tripping valve clapper.

2. Equip alarm valve with pressure alarm switch with 115-230 VAC, 10 AMP, 12 VDC rating with one normally open contact and one normally closed contact.

3. Provide an additional testable check valve, separated with a 6 inch spool piece on the supply side of the alarm valve with two test ports, two gauges, and two test valves.

2.5 PRESSURE GAUGES

A. Provide pressure gauges designed for use with air or water.

1. Provide Bourdon type with enclosed phosphor-bronze tube.

2. Moving parts: Brass or stainless steel with phosphor-bronze hair spring.

3. Case and ring: Brass or stainless steel with ring threaded or pressed over case.

4. Size: 4-1/2 inch minimum.

5. Gauge scale: Dial marking subdivision no finer than 1 percent of maximum scale reading and accurate to 2 percent or less. Provide minimum scale range twice the maximum working pressure (when possible).

2.6 VALVE SUPERVISION

A. Equip valves which control water to automatic sprinkler heads with supervisory switches having one normally open contact and one normally closed contact.

1. Provide valve supervisory switches with single pole double throw switching contacts, housed in gasketed weather tight enclosure.

2. Supply supervisory device specifically designed to mount on, and operate reliably with, type of control valve being monitored.

3. Adjust valve position switches to transmit a supervisory signal within two revolutions of valve operating hand wheel or crank (away from its full open position).

2.7 SPRINKLER HEADS AND ACCESSORIES

A. Provide listed sprinkler heads and accessories that are 212 degrees F rated with 1/2 inch orifice and K factor of 5.6 (plus or minus 10 percent) in accordance with the following, unless otherwise noted in Contract Documents.

1. Upright Sprinkler Heads: Brass upright type. Use in areas without suspend ceilings.

2. Sprinkler Guards: Provide where sprinkler heads are exposed to external damage.

3. Corrosion-Resistant Sprinklers: Provide in locations where chemicals, moisture or other corrosive vapors exist.

2.8 HEAT COLLECTORS/WATER SHIELDS

A. Provide in areas where there is no ceiling, and when multiple level protection is required, i.e., at open grating or open high roofed areas, side wall or upright type sprinklers.

1. Equip sprinklers with heat collectors/water shields made of 18-gage flat steel stock, water shields 20 inch x 20 inch square, with 2 inch downward projecting vertical lip. Weld corners.

2. Prime and paint heat collectors/water shields with two coats of red enamel.

3. Drill 6 each 1/2 inch diameter holes equally spaced around circumference of a 6 inch diameter circle centered in heat collectors/water shields.

2.9 FIRE DEPARTMENT CONNECTIONS

A. Provide fire department connections with 4 inch minimum outlet, two 2-1/2 inch minimum inlets, National Fire Standard threads, cast brass body, clapper in each inlet, plugs, and attached chains.

1. When wall-mounted, locate pumper connections on blank masonry wall, or provide wall with one hour fire barrier for 10 feet in all directions from pumper connection, and identify automatic sprinkler connection.

2. Identify individual devices by raised letters on the individual devices, or attach escutcheon plates of same material.

3. Locate 34 inches (plus or minus 2 inches) from grade level to center of inlet connection.

2.10 SPLASH BLOCKS

A. Provide concrete splash blocks, approximately 12 inches by 24 inches by 4 inches thick.

PART 3 EXECUTION

3.1 EXAMINATION

A. Prior to installation carefully inspect installed Work of other trades, whether pre-existing or part of this Project, and verify that such work is complete to the point where installation of sprinkler system may start.

B. Notify the Contract Administrator should conditions exist, not resulting from Work of this Project, that prohibits the installation from conforming to referenced codes, regulations, standards and approved design.

C. Install materials and equipment that are free of moisture, scale, corrosion, dirt and other foreign materials.

3.2 INSTALLATION

A. General:

1. Install system in accordance with NFPA 13.

2. Do not locate sprinkler heads closer then 12 inches to supply air registers.

3. Visually examine pipe, fittings, valves, equipment and accessories to ensure they are clean and free of burrs, cracks and other imperfections before installation. Clean pipe interiors by flushing.

4. Verify dimensions in field. Lay out Work in the most direct and expeditious manner to avoid interferences.

5. Drawings show only approximate building outlines and interior construction details as an aid in understanding the scope of Work. Investigate structural and finish conditions affecting the Work and arrange Work accordingly, providing such sprinkler heads, fittings, traps, draining valves, piping, and accessories as required to meet such conditions.

6. Do not render inoperative any system without the prior approval of the Contract Administrator. Coordinate necessary shutdowns of existing systems by notifying the Contract Administrator a minimum of 7 working days before rendering such systems inoperative.

7. Coordinate sprinkler piping, sprinkler heads and associated equipment with existing ceiling or roof materials, lighting, ductwork, conduit, piping, suspended equipment, structural and other building components.

8. Dispose of equipment removed for completion of this Project as directed by the Construction Inspector.

9. Provide access openings in areas where concealed sprinkler piping is installed.

B. Piping:

1. Configure piping system to provide a means to totally flush the system piping.

2. Mark and identify sprinkler piping in accordance with Section 15190, Mechanical Identification.

3. Conceal sprinkler piping in areas with suspended ceilings. Install piping in exposed areas as high as possible using necessary fittings and auxiliary drains. Keep

sprinkler piping a minimum of 7 feet 6 inches above finish floor. Where not possible, run piping at same elevation as existing piping and ducts. Obtain prior approval from the Construction Inspector.

4. Install Inspector's Test piping at the hydraulically most remote point of the automatic sprinkler system and discharge to exterior of building. Where possible, conceal test piping in wall and provide access panels for valve and sightglass and protect from freezing. Inspector's Test Station and piping location shall be approved by the Construction Inspector.

5. Provide auxiliary drains. When trapped capacity exceeds 5 gallons, use a 1 inch valve, nipple and cap. When trapped capacity is less than 5 gallons, use a 1 inch nipple and cap or plug. When trapped capacity is 50 gallons or more, use a valve not smaller than 1 inch, piped to an accessible location as per main drain criteria.

6. Provide main drain valve at system alarm valve and extend piping to exterior of building. Use galvanized piping and fittings downstream of drain valve. Provide splash blocks where discharges spill on unpaved surfaces.

7. Diamond coredrill or sleeve concrete penetrations, then grout and seal with fire-resistive material, securely held in place. Use UL listed penetration projection design when penetrating fire resistance rated construction.

C. Pipe Support: Install pipe hangers for pipe supports inside buildings in accordance with NFPA 13. Install concrete anchors by drilling, using UL listed or FM approved anchors. Do not use explosive-driven fasteners as a method of installing anchors or hangers. Do not hang other piping or equipment from sprinkler pipe.

D. Welding:

1. Do not field weld sprinkler piping.

2. Shop weld pipe and fittings using approved welding fittings. Comply with NFPA 13 for welding methods.

3. Provide a blind flange at each end of welded headers.

4. Use certified welders. Check certificates before Work commences.

E. Alarm Valve: Set plumb and unobstructed. Provide minimum clear distances from walls as follows:

1. Rear - 12 inches

2. Sides 18 inches

3. Front 36 inches

F. System Riser: Install riser from underground so that no joint or fitting occurs within the bearing zone of foundation structures or occurs at least 5 feet from any foundation structure.

G. Control Valves: Provide OS&Y or indicating butterfly type fire protection control valves. Installed so open or closed status can be readily seen from finish floor.

1. Install control valves on supply lines (outside protected area) into elevator shaft and elevator equipment room, computer rooms, and identified special protection areas to meet ANSI 17.1. Valve will be chained and locked open by LANL.

H. Sprinklers and Accessories:

1. Provide upright type heads, installed in upright position, on exposed piping below ceiling.

2. Align sprinklers below ceiling parallel to ceiling features and walls, and locate as close to center as possible in halls and corridors.

3. Provide chrome-plated escutcheons where exposed piping passes through finished floors, walls, partitions and ceilings. Secure to pipe with set screws or spring clips.

4. Protect sprinklers subject to mechanical injury with guards as follows:

a. Provide guards in mechanical equipment rooms, electrical equipment rooms, janitor's closets, and storage areas where distance from sprinkler deflector to finish floor is less than 15 feet.

b. In all other areas, provide guards where distance from sprinkler deflector to finish floor is less than 7 feet.

5. Provide one spare sprinkler cabinet, complete with sprinklers of assorted temperature ratings of the type necessary and in use throughout the installation, at each main riser valve. Equip each cabinet per NFPA 13.

I. Signs:

1. Install Hydraulic Design Information sign directly above controlling alarm valve and include design data as required by NFPA 13.

2. Provide a descriptive sign noting function for every valve in sprinkler system. Use white lettering on red background.

J. Painting: Paint sprinkler risers, unfinished pumper connection piping and sprinkler piping in equipment rooms with two coats Fire Protection Red. Apply one coat of primer and one coat of paint to match background, on new exposed piping in occupied spaces. Do not paint automatic sprinkler heads.

K. Unsupervised Water Supplies: Install approved water flow detection device on underground water supplies entering buildings when fire protection riser is more than 10 lineal feet from exterior of building.

L. Water Supply Control Valve: Where not otherwise provided for, provide water supply control valve(s) conforming to the requirements of NFPA 24.

1. Provide UL listed or FM approved valves, with listed indicating Post Indicating. Locate valve at least 40 feet from building.

2. Where this location is not possible, the valve may be located closer to building.

3. When valve is located less than 20 from building, or a wall post indicating valve is provided, the wall 10 feet in all directions of the valve shall be blank masonry or one hour fire resistance rated construction.

M. Special Tools and Devices: Provide one complete set of special tools or special devices required for operation, testing and/or maintenance of equipment furnished under this Section.

3.3 EQUIPMENT INSTALLATION

A. Install devices or equipment not specifically covered by these Specifications in accordance with manufacturer's instructions.

3.4 CONNECTIONS TO EXISTING SYSTEMS

A. Final connection of new systems to existing underground piping systems will be made by LANL with materials furnished by the Contractor.

B. Final connection of new systems to other existing systems above grade shall be done by the Contractor after contacting the Contract Administrator that shall implement the Laboratory Fire Protection Impairment Procedure. Do all final connections of this type with only one outage per existing system.

3.5 STERILIZATION

A. Sterilize sprinkler system underground piping upstream of alarm valve in accordance with Section 15470.

B. Do not sterilize sprinkler system downstream of alarm valve.

3.6 EXISTING CONDITIONS

A. Area Restoration: Restore areas disturbed by the fire protection system installation to the condition existing prior to start of construction.

B. Field Inspection: Field inspect areas of sprinkler installation for potential interference with ducts, cable trays, electrical or mechanical equipment, and other similar interferences. Carefully coordinate Work under this section with other Work.

3.7 TESTING

A. Leak test piping in accordance with Section 15992.

B. Flush system with water in accordance with NFPA 13 and 24.

1. Comply with the discharge requirements noted in Section 15470, Part 1.

2. The Construction Inspector will notify ESH-18 as noted in Section 15470, Part 1, Notifications and Records Required of Construction Inspector.

3.8 INSPECTION

A. Inspect new fire protection system in accordance with NFPA 13 and 24, in the presence of the Construction Inspector. Give advance notice, as specified below, to the Construction Inspector prior to any tests.

1. Notify the Construction Inspector upon completion of installation of all materials and equipment. LANL will schedule inspection of installation within two working days after Contractor notification.

2. Correct deficiencies noted during this inspection and correct prior to further testing.

END OF SECTION